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The AIM Mail System at the CIA

Automating the Bureaucracy

*Central Intelligence Agency
Office of Data Processing*

02/23/83
AIM-00

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Disclaimer

My remarks do not necessarily reflect official positions of the Central Intelligence Agency or the United States Government.

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This presentation is not

A pitch for office automation

A tutorial in how to do it yourself

A comparison of electronic mail systems

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What I will describe

The way we did it

What our system does today

Pitfalls

Suggestions based upon our experiences

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The Intelligence Business

Essentially an information factory

- information arrives, usually in electronic form
- information is refined
- finished product is distributed to our customers

Computers are analogous to the assembly line

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Computing Environment

General Timesharing Service

- two loosely-coupled VM/CMS systems
- over 5000 users

Other timesharing services

Interfaces to external telecommunications systems

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Objectives

Simple and easy to use by "real people"

High performance

Extensible

Capable of handling official correspondence

Full support for smart glass teletypes

Secure

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Implementation Approach

Central database virtuals

User virtuals for document creation, editing, display
and management

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PROC System

Facility to support development of complex, assembly language system facilities

Macro and text libraries

- structured macros
- stack oriented
- multitasking
- interprocess communication (VMCF)

Available through Waterloo library

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Folders

Identifier - name

Standard user folders

- INBOX incoming mail
- WORK work in process
- OUTBOX outgoing mail

User defined folders

Lettered "folders" - accessed minidisks

System folders

Folder sharing - GET, PUT and ALL accesses

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Documents

Identifiers

- category (MEMO, LETTER, etc)
- name
- ordinal reference

Routing

- FROM originator other than creator
- THRU individuals whose concurrence is required in sequence before document is released
- TO recipients of "action" copies
- CC recipients of "information" copies

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Documents

Attributes set by user

- subject
- routing
- classification
- codewords
- user defined keywords
- EYES ONLY
- password

Attributes set by system

- sent / not sent
- seen / not seen
- various file system data elements, such as the date the document was created, the number of records, etc.

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Frequently Used Commands

LIST	list documents or folders
DISPLAY	view a document
PRINT	print a document on an OS/6
EDIT	create or alter a document using a local editor - limited support for XEDIT
SEND	send a new document - create a new document using the model facility if necessary
REPLY	create a document in response to another
FORWARD	route a document to the next addressee(s)
QUERY	display the status of documents and the system
ERASE	get rid of this copy of a document
MOVE	copy a document from one folder to another

STAT

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Other System Commands

CREATE	create a new document or folder
COPY	copy documents from one folder to another
DUPLICATE	create a duplicate copy of a document in another folder
USE	logically group folders
MONITOR	request notification when events occur
ACCESS	designate search sequences for system folders
OPEN	explicitly open a folder
CLOSE	explicitly close a folder
FOLDER	designate who may access a folder
HELP	display online documentation

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Simplicity vs. Flexibility

Models

- EXEC-like templates

Aliases

- nicknames

System folders

System Administrators

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Data Integrity

File structure

Database backup

SEND recovery

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Database

Initial approach

- CMS file system
- utterly breaks down with 20,000+ files/minidisk

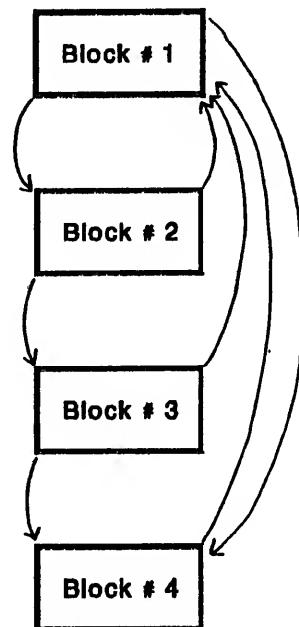
Current technique

- block I/O
- CMS minidisks (formatted 1K) with all space reserved



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File Structure

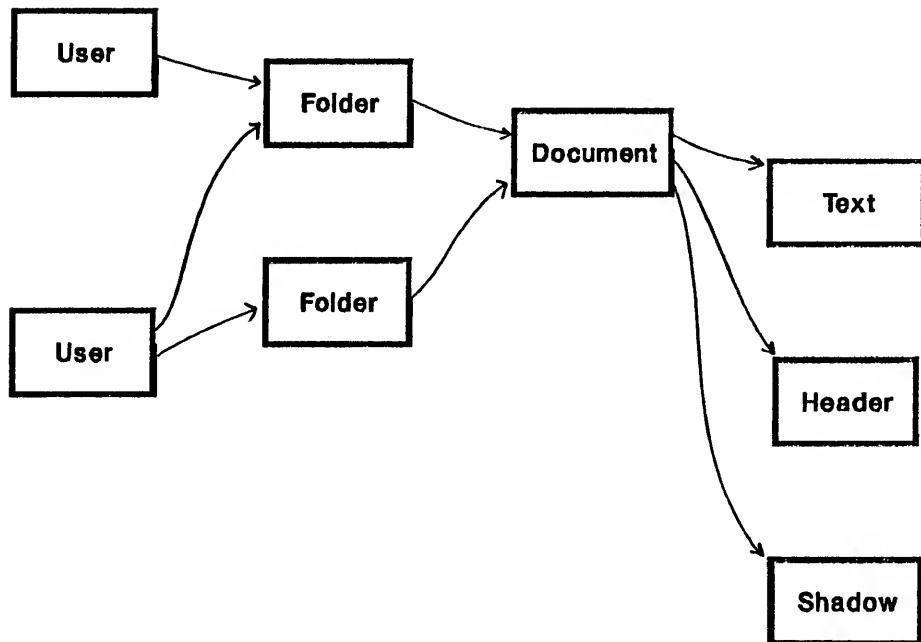


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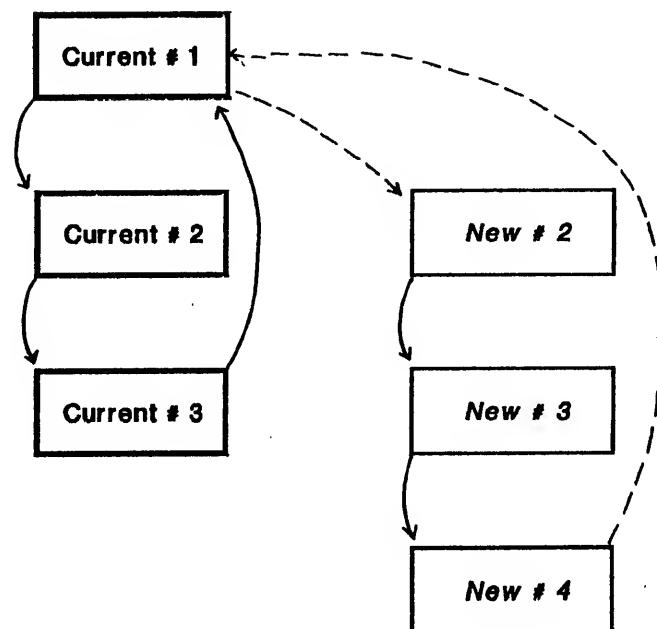
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Database Structure



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File Integrity



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File Handler

Requests

- GET / PUT
- file identifier (disk and block numbers)

Returns

- data to local queue
- data to user queue (blocked 4K)

Less than 5% of calls are writes

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Backup

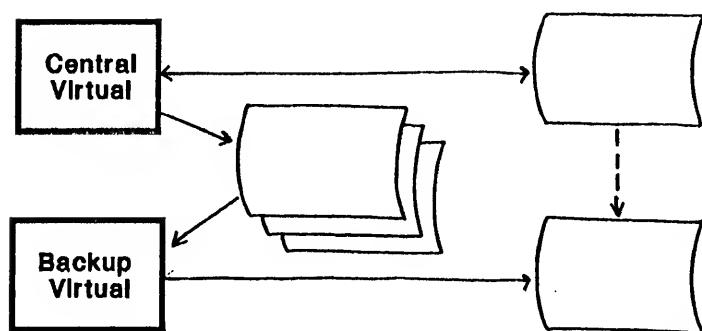
Transaction for complete data recovery

Dual database for quick recovery

Only database writes logged

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Backup Structure



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Database Virtual Task Structure

OPEN get a folder directory

GET read a document

PUT file a document

Other commands

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User Virtual Task Structure

Main task process all commands

File handler GET / PUT files

IMACOM update directory

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Interpreter

Variables

- simple: single line
- complex: multiple-line

Keywords recognized by system

Commands to interpreter

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Interpreter Variables and Commands

SYSUSER	SYSCMD	SYSNAME	SYSDOC
SYSDATE	SYSMNTH	SYSNDAY	SYSYEAR
SYSNDAT	SYSDAY	SYSTIME	SYSTI24
SYSDATI	SYSJUL	SYSDAT2	SYSCLAS
SYSREV	SYSDOD	SYSOU	SYSSD
SYSSST	SYSSU	SYSEEND	SYSEENU
SYSCHND	SYSCNU	SUBJECT	TEMP
TEMPO01	TEMPO02	TEMPO03	CLASS
POSTAL	REJECT	REPLYTO	REPLYCC
REPLYTH	REF	KEYWORD	CODEWRD
PROMPT	RETCODE	SYSNUM	SYSEVAL
SYSFOLD	SYSF1	SYSF2	SYSLINE
SYSLEN	SYSHTXT	SYSCASE	SYSWHO
SYSALI	RESET	SYSSTRG	SYSPARS
TO	CC	THRU	FROM
CORD	BCC	AS	AT
PRIV	LEVEL	RETAIN	PRTY
RECEIPT	READ	CALL	SYSFILE
CAMREAD	TYPE	MTYPE	STACK
AUDIT	SEdit	COPY	QUIT
CONTROL	COMMENT	ALIAS	
IF	ELSE	ENDIF	
DO	DOEXIT	DONEXT	ENDDO
CASENTR	CASE	CASELSE	ENDCASE
TEXT	ENDTEXT	PROC	ENDPROC
INPUT	INSERT	EXIT	QUIT

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Typical Model

```
&if &syscmd eq FILE or &syscmd eq SAVE
&subject="Note Model"
  &exit
&endif
&type
&call a$class
&&class = &sysclas,&syshtxt(&class)
&type
&call b$adr$ to text nomulti prompt error verify default
&type
&call a$subject
&&subject = &syshtxt(&subject)
&&tempsub= '&&subject'
&&if &syscmd eq DISPLAY
  &&type '&&sysndat from: &&sysname subject: &&tempsub '
&&endif
&stack user1
&if &sysnum(&class) gt 0
.nf
.he "&class"
.fe "&class"
&endif
DATE: &sysdate

NOTE TO: &to

SUBJECT: &subject
.nf

&mtype '' 'Enter Text, or ?'
&input
&mtype '' 'DOCUMENT ACCEPTED. PLEASE WAIT ...'
```

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System Directory

Userid

Name

Telephone number

System

Privileges

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System Control Commands

USER	display current and maximum number of users
INFO	display system performance statistics
DIRECTORY	update system directory
SHUTDOWN	terminate the system

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Performance

Bottlenecks

- paging
- I/O
- processor

VMCF not a culprit

Users

- as many as 30 concurrently
- about 300 unique users daily
- over 1,000 in directory

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Performance Statistics

AIMSYS INFO Command*

CNTRL101 HAS BEEN UP FOR 0 DAYS, 13 HOURS, 57 MINUTES, 7 SECONDS
--> 4% ACTIVE 11% VMCF WAIT 63% I/O WAIT
--> 1020 OPENS, 630 (62%) DEFERRED
--> 82571 READS, 63127 (76%) FROM DISK 8055 WRITES, 7334 (91%) TO DISK
--> 20% STORAGE UTILIZATION 10 MAX USERS
--> 65982 LOCKS REQUESTED, 253 (0%) WAITED

(*) figures were collected on the day of the blizzard

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User Acceptance

Used by management

User documentation

User training

User demands

New services

Improved performance

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Development Effort

Scope of effort

- concept in 1978
- development begun in 1979 as a back-burner project
- full-scale development in 1980
- restricted version available for testing in 1981
- production in 1982

Software

- 580 modules, 88K lines of code in user virtual
- 185 modules, 43K lines of code in central virtual

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Dependencies

Control Program

- three local diagnoses (optional)

Conversational Monitor System

- block I/O
- enhanced abend recovery (optional)

Waterloo Script

Local editor

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Electronic Mail vs. Word Processing

Many users find command-based, interactive systems unfriendly and frightening

Our customers are willing to put a computer terminal or a word processor on each desk, but not both

Connectivity and secure sharing of data is a problem with most word processing systems

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Host-based Word Processor

Exploits the intelligence in our standard terminal to provide integrated word processing functions to the timesharing system user

An application program that runs under CMS

Provides a "what you see is what you get editor"

Uses Waterloo Script in a transparent manner to format text

Will be integrated with AIM soon

Looks, feels and tastes like a "typical" word processor

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Other Advanced Applications

Trend is toward complex applications that manage the screen while interfacing to back-end database systems

Front-end (user virtual) portions of AIM must co-exist in same virtual machine with applications code

Special monitor to allow limited multitasking

PL/I interface

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Future

Import / Export

Multiple central database virtuals

Multiple VM systems

Spelling checkers

Calendars, schedules, reminders

Event support, timers

Archiving